(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－224795

(43)公開日　平成10年(1998)８月21日

(51)Int.Cl.[6]	識別記号	ＦＩ	
Ｈ０４Ｎ　7/32		Ｈ０４Ｎ　7/137	Ｚ

審査請求　未請求　請求項の数14　ＯＬ　（全６頁）

(21)出願番号　特願平9－18725

(22)出願日　平成９年(1997)１月31日

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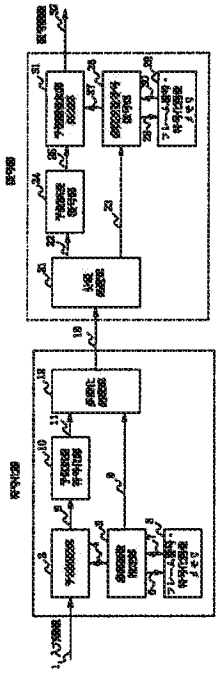
(54)【発明の名称】　動画像符号化方法、復号方法、符号化器および復号器

(57)【要約】

【課題】　動画像をフレーム間予測を用いて符号化する場合に、フレーム間予測効率を向上させ、それにより符号化情報を削減する。

【解決手段】　フレーム番号・符号化画像メモリ５に時系列の参照フレーム番号とこれら参照フレーム番号に対応する参照画像が記憶されている。参照画像指定部３は参照フレーム番号６をフレーム番号・符号化画像メモリ５に引き渡し、該参照フレーム番号の参照画像７を得、予測画像４を生成し、該参照フレーム番号を符号化した参照フレーム番号データ９を出力する。予測処理部２では入力画像１が予測画像４と比較されて予測誤差画像８が出力され、予測誤差画像８は予測誤差符号化部１０で符号化され、符号化データ１１となる。多重化処理部１２では符号化データ１１と参照フレーム番号データ９が多重化され、多重化符号化データ１３として復号器に出力される。



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【特許請求の範囲】

【請求項１】　動画像をフレーム間予測を用いて符号化する動画像符号化方法において、符号化済みの画像データに時系列順のフレーム番号を付与しておき、これから符号化しようとする画像に対して、任意の符号化済みの画像を用いて予測を行なうと共に、予測に用いた符号化済みの画像のフレーム番号も符号化を行うことを特徴とする動画像符号化方法。

【請求項２】　上限が設定された複数の符号化済み画像を予測に用いる、請求項１の動画像符号化方法。

【請求項３】　複数の符号化済み画像の線形和を予測に用いる、請求項２記載の動画像符号化方法。

【請求項４】　画像全体を任意の大きさおよび形状の部分に区切った部分画像の線形和を予測に用いる、請求項１記載の動画像符号化方法。

【請求項５】　これから符号化しようとする画像のフレーム番号の近傍のフレーム番号の画像のみを予測に用いる、請求項１記載の動画像符号化方法。

【請求項６】　フィールド単位の識別子がフレーム番号に付加されている、請求項１から５のいずれか１項記載の動画像符号化方法。

【請求項７】　請求項１から６のいずれか１項記載の動画像符号化方法に対応する動画像復号方法において、これから復号しようとする画像に対して予測に用いられた画像のフレーム番号を知ることにより、予測を行うことを特徴とする動画像復号方法。

【請求項８】　上限が設定された複数の符号化済み画像を予測に用いる、請求項７の動画像復号方法。

【請求項９】　複数の符号化済み画像の線形和を予測に用いる、請求項８記載の動画像復号方法。

【請求項１０】　画像全体を任意の大きさおよび形状の部分に区切った部分画像の線形和を予測に用いる、請求項７記載の動画像復号方法。

【請求項１１】　これから符号化しようとする画像のフレーム番号の近傍のフレーム番号の画像のみを予測に用いる、請求項７記載の動画像復号方法。

【請求項１２】　フィールド単位の識別子がフレーム番号に付加されている、請求項７から１１のいずれか１項記載の動画像復号方法。

【請求項１３】　時系列順の参照フレーム番号が付与された、符号化された参照画像を記憶しているフレーム番号・符号化画像メモリと、
参照フレーム番号を前記フレーム番号・符号化画像メモリに引き渡し、対応する前記参照画像を得、その中から予測効率の最も良い予測画像を生成し、または画像全体を任意の大きさおよび形状の部分に区切り、その部分ごとに参照画像データと参照フレーム番号を決定して予測画像を生成し、また前記参照フレーム番号を符号化し、参照フレーム番号データとして出力する参照画像指定手段と、

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入力画像を前記予測画像と比較して、予測誤差を出力する予測処理手段と、
前記予測誤差を符号化し、符号化データとして出力する予測誤差符号化手段と、
前記符号化データと前記参照フレーム番号データを多重化し、多重化符号化データとして出力する多重化処理手段を有する符号化器。

【請求項１４】　請求項１３に対応する復号器であって、
前記多重化処理手段から出力された多重化符号化データを符号化データと参照フレーム番号に分離する分離処理手段と、
前記符号化データを復号し、予測誤差に変換する予測誤差復号手段と、
前記符号化器中のフレーム番号・符号化画像メモリと同じ、参照フレーム番号が付与された参照画像を記憶しているフレーム番号・符号化画像メモリと、
前記分離処理手段から参照フレーム番号を入力し、該参照フレーム番号を前記フレーム番号・符号化画像メモリに引き渡し、対応する参照画像を受け取り、前記参照画像指定手段と同様にして予測画像を生成し、出力する参照画像番号復号手段と、
前記予測誤差に前記予測画像を加算し、復号画像を出力する予測画像加算処理手段を有する復号器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は動画像をフレーム間予測を用いて符号化する動画像符号化方法および復号方法に関する。

【０００２】

【従来の技術】従来の方法では、ひとつの参照画像を用いるフレーム間予測符号化では、予測の方向が時系列で見て古いフレームから新しいフレームを予測する方法がとられていた。そのため単純なフレーム間予測では逆方向予測が行えない。

【０００３】また、フレーム内挿予測の場合には、上記のフレーム間予測符号化されたフレームのうち、処理順序で見て連続する二つのフレームを基準フレームとし、時系列で見てそれらの基準フレームの間にはさまれるフレームのみ、両方の基準フレームを参照画像として用いることができる。二つの基準フレームを参照画像として予測するフレームは、それ以後の符号化処理において、参照画像として使用することはできなかった。

【０００４】これは、直前にフレーム間符号化した一つあるいは二つのフレームを元にして参照画像とする規則によって、参照できるフレームを定義しているためである。

【０００５】図３に従来方法の符号化順序と参照画像の例を示す。フレーム番号が１、５、８のフレームは基準フレームであり、第５、第８フレームは第１フレームを

元にフレーム間予測符号化される。それらに挟まれた第2、第3、第4フレームは第1、第5フレームからフレーム内挿符号化され、第6、第7フレームは第5、第8フレームからフレーム内挿符号化がされる。

【0006】

【発明が解決しようとする課題】従来の予測方法では、時系列で見て新しいフレームを参照画像として予測を行うことが不可能であった。また、時系列で見て同一の方向から2フレーム以上を予測に用いることは不可能であった。また、直前に符号化した参照フレームは二つまでという制限があった。

【0007】本発明の目的は、フレーム間予測効率を向上させ、それにより符号化情報量を削減し、画像の圧縮率を向上させる動画像符号化方法および復号方法とこれらに対応する符号化器と復号器を提供することにある。

【0008】

【課題を解決するための手段】本発明の動画像符号化方法は、符号化済みの画像データに時系列順のフレーム番号を付与しておき、これから符号化しようとする画像に対して、任意の符号化済みの画像を用いて予測を行うと＊共に、予測に用いた符号化済みの画像のフレーム番号も符号化を行う。

【0009】また、本発明の動画像復号方法は、これから復号しようとする画像に対して予測に用いられた画像のフレーム番号を知ることにより、予測を行う。

【0010】符号化された画像データのヘッダに時系列順のフレーム番号を付与し、復号時にそのフレーム番号から参照画像を特定することにより、フレーム間予測とフレーム内挿予測という区別をなくし、予測において参照できるフレームとその数を一般化する。

【0011】符号化対象である画像を動き補償フレーム間予測を用いて符号化する場合、予測に用いる参照画像のフレーム番号を複数個指定することにより、既に符号化された任意のフレーム番号の画像を複数個、予測に用いることができる。

【0012】図2に符号化順序と参照画像の例を示し、表1に、これに対応する処理画像と参照フレーム番号の関係を示す。

【0013】

【表1】

処理順序	フレーム番号	参照フレーム番号
1	1	なし
2	5	1
3	4	5
4	3	4
5	2	1，3
6	8	5
7	7	8
8	6	5，7，8

【0014】表1に示すように、参照フレーム番号を用いることにより、逆方向のフレーム間予測やフレーム間予測を行う方向に関係なく2フレームあるいは3フレームによる線形和予測を混在させることができる。ここでは最大3フレームを参照して予測に用いる例まで示したが、参照フレーム番号は4フレーム以上でも構わない。

【0015】復号側では、予め復号した画像のヘッダにあるフレーム番号と、対応する画像データを復号した復号画像を記憶しておき、符号化側と同様にして予測画像を生成する。

【0016】本発明の実施態様によれば、予測画像として参照するフレームを複数用意し、それらを切り替えて予測に用いるか、複数の画像の線形和によって予測を行う。ここで、これらの切り替えや線形和といった予測モードは、1フレームの画像全体に対して処理するだけでなく、画像全体を任意の大きさ及び形状の部分に区切った部分画像に対して処理することもできる。

【0017】例えば、図2において、第6フレームの予測には、第5、第7、第8フレームを用いることができるが、一例として表2に第6フレームに対する使用可能な予測モードの例を示す。

【0018】

【表２】

予測モード	予測に用いる画像
A	第５フレームのみ
B	第７フレームのみ
C	第８フレームのみ
D	第５と第７フレームの線形和
E	第５と第８フレームの線形和
F	第７と第８フレームの線形和
G	第５と第７と第８フレームの線形和

【００１９】本発明の他の実施態様では、予測画像として参照するフレームをこれから符号化するフレームから［－Ｎ，＋Ｍ］フレームの範囲に制限することにより、予測に必要な画像を記憶しておくフレーム数をＮ＋Ｍ＋１フレームに制限する。この制限がない場合には、過去に符号化した画像をすべて蓄えておく必要がある。

【００２０】本発明のさらに他の実施態様では、動画像が現行のテレビジョン信号のようなインタレース信号で、１フレームの画像が飛び越し操作により２フィールドの画像から成り立っている場合に、フレームだけでなくフィールドの識別子も用いて、フィールド単位の予測を可能にする。

【００２１】本発明の符号化器は、時系列順の参照フレーム番号が付与された、符号化された参照画像を記憶しているフレーム番号・符号化画像メモリと、参照フレーム番号を前記フレーム番号・符号化画像メモリに引き渡し、対応する前記参照画像を得、その中から予測効率の最も良い予測画像を生成し、または画像全体の任意の大きさおよび形状の部分に区切り、その部分ごとに参照画像データと参照フレーム番号を決定して予測画像を生成し、また前記参照フレーム番号を符号化し、参照フレーム番号データとして出力する参照画像指定手段と、入力画像を前記予測画像と比較して、予測誤差を出力する予測処理手段と、前記予測誤差を符号化し、符号化データとして出力する予測誤差符号化手段と、前記符号化データと前記参照フレーム番号データを多重化し、多重化符号化データとして出力する多重化処理手段を有する。

【００２２】また、本発明の復号器は、前記多重化処理手段から出力された多重化符号化データを符号化データと参照フレーム番号に分離する分離処理手段と、前記符号化データを復号し、予測誤差に変換する予測誤差復号手段と、前記符号化器中のフレーム番号・符号化画像メモリと同じ、参照フレーム番号が付与された参照画像を記憶しているフレーム番号・符号化画像メモリと、前記分離処理手段から参照フレーム番号を入力し、該参照フレーム番号を前記フレーム番号・符号化画像メモリに引き渡し、対応する参照画像を受け取り、前記参照画像指定手段と同様にして予測画像を生成し、出力する参照画像番号復号手段と、前記予測誤差に前記予測画像を加算し、復号画像を出力する予測画像加算処理手段を有する。

【００２３】

【発明の実施の形態】次に、本発明の実施の形態について図面を参照して説明する。

【００２４】図１は本発明の一実施形態の符号化器と復号器のブロック図である。

【００２５】符号化器は予測処理部２と参照画像指定部３とフレーム番号・符号化画像メモリ５と予測誤差符号化部１０と多重化処理部１２で構成されている。

【００２６】復号器は分離処理部２１と予測誤差復号部２４と予測画像加算処理部３１と参照画像番号復号部２６とフレーム番号・符号化画像メモリ２８で構成されている。

【００２７】フレーム番号・符号化画像メモリ５には時系列の参照フレーム番号が付与された、符号化された参照画像が記憶され、フレーム番号・符号化画像メモリ２８には時系列の参照フレーム番号が付与され、符号化画像メモリ５に記憶されている参照画像と同じ参照画像が記憶されている。

【００２８】入力画像１は予測処理部２に入力され、予測画像４と比較されて予測誤差画像８が出力される。参照画像指定部３は、フレーム番号・符号化画像メモリ５に参照フレーム番号６を引き渡し、参照画像データ７を得る。その結果、参照画像指定部３では、予測の候補と

なる参照画像データ７の中から最も予測効率の良い予測画像４を生成する。あるいは参照画像指定部３では、画像全体を任意の大きさおよび形状の部分に区切り、その部分ごとに予測に用いる参照画像データと参照フレーム番号を決定する。この予測には、複数の参照画像データの線形和を用いることができる。予測画像の候補のうち予測誤差の最も小さいものを選ぶ。参照画像指定部３からは、予測画像４の他に選択された参照フレーム番号を符号化した参照フレーム番号データ９が出力される。予測誤差画像８は予測誤差符号化部１０において符号化され、符号化データ１１として出力される。符号化データ１１と参照フレーム番号データ９は多重化処理部１２において多重化され、多重化符号化データ１３として符号化器より出力される。

【００２９】復号器では、入力された多重化符号化データ１３が分離処理部２１において、符号化データ２２と参照フレーム番号データ２３に分離される。符号化データ２２は予測誤差復号部２４において、復号され、予測誤差画像２５に変換される。参照フレーム番号データ２３は参照画像番号復号部２６に入力され、画像中の区分ごとに参照フレーム番号２９をフレーム番号・符号化画像メモリ２８に対して指定し、参照画像データ３０を受けとる。参照画像番号復号部２６では参照画像指定部３と同様にして予測画像２７が生成され、予測画像加算処理部３１に出力される。予測画像加算処理部３１では予測誤差画像２５に予測画像２７が加算され、復号画像３２が出力される。

【００３０】

【発明の効果】以上説明したように本発明は、フレーム間予測時に参照するフレーム番号を符号化データに埋め込むことにより、参照画像の自由度が向上し、逆方向予測や３フレーム以上の画像による予測も可能になるなど画像列の特徴に応じて効率良く予測できるため、符号化における圧縮率が向上する効果がある。

【図面の簡単な説明】

【図１】本発明の一実施形態の符号化器と復号器のブロック図である。

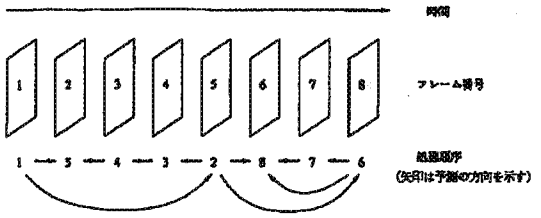
【図２】本発明の請求項１による符号化順序と参照画像の例を示す図である。

【図３】従来の方法の符号化順序と参照画像の例を示す図である。

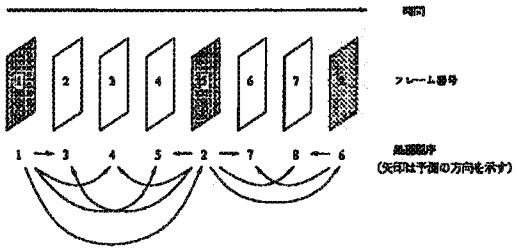
【符号の説明】

１　入力画像
２　予測処理部
３　参照画像指定部
４　予測画像
５　フレーム番号・符号化画像メモリ
６　参照フレーム番号
７　参照画像データ
８　予測誤差画像
９　参照フレーム番号データ
１０　予測誤差符号化部
１１　符号化データ
１２　多重化処理部
１３　多重化符号化データ
２１　分離処理部
２２　符号化データ
２３　参照フレーム番号データ
２４　予測誤差復号部
２５　予測誤差画像
２６　参照画像番号復号部
２７　予測画像
２８　フレーム番号・符号化画像メモリ
２９　参照フレーム番号
３０　参照画像データ
３１　予測画像加算処理部
３２　復号画像

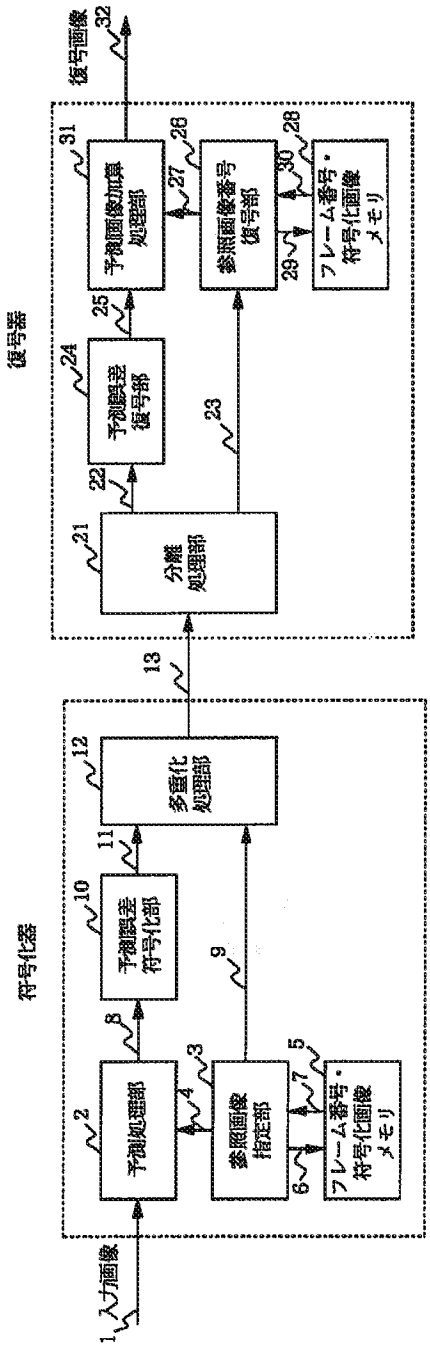
【図２】



【図３】



【図1】


符号化器
復号器
入力画像
予測処理部
参照画像指定部
フレーム番号・符号化画像メモリ
予測誤差符号化部
多重化処理部
分離処理部
予測誤差復号部
予測画像加算処理部
参照画像番号復号部
フレーム番号・符号化画像メモリ
復号画像
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ENGLISH TRANSLATION

Machine translation JP10224795

(19)**Publication country**Japan Patent Office (JP)
(12)**Kind of official gazette**publication of patent applications (A)
(11)**Publication No.**JP,10-224795,A
(43)**Date of Publication**Heisei 10(1998) (1998) August 21
(54)**Title of the Invention**A video encoding method, a decoding method, coding equipment, and a decoder
(51)**International Patent Classification (6th Edition)**

H04N 7/32
FI

H04N 7/137 Z
Request for Examination Unrequested
The number of claims 14
Mode of ApplicationOL
Number of Pages6
(21)**Application number**Japanese Patent Application No. 9-18725
(22)**Filing date**Heisei 9(1997) (1997) January 31
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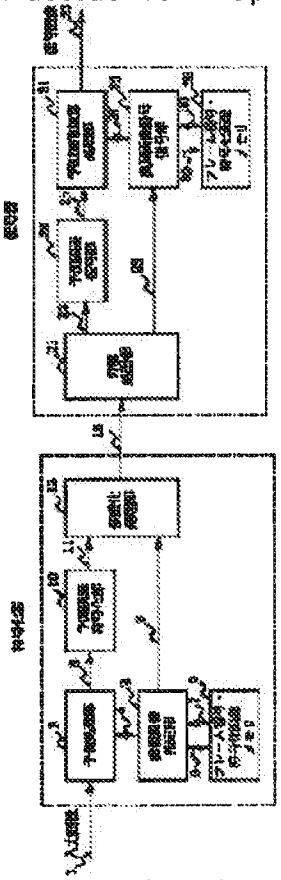
Abstract:
PROBLEM TO BE SOLVED: To reduce coding information by improving an inter-frame prediction efficiency in the case of coding a moving image through the use of inter-frame prediction. SOLUTION: A frame number coding image memory 5 stores a reference frame number in time series and a reference image corresponding to the reference frame number. A reference image designation section 3 gives a reference frame number 6 to a frame number coding image memory 5 to obtain a reference image 7 of the reference frame number 6 and generates a prediction image 4 and outputs the reference frame number data 9 obtained by coding the reference frame number 6. A prediction processing section 2 compares an input image 1 with the prediction image 4 to provide an output of a prediction error image 8. The prediction error image 8 is coded by a prediction error coding section 10 into coded data 11. A multiplex processing section 12 multiplexes the coded data 11 and the reference frame number data 9 and provides an output of

the result to a decoder as multiplexed coded data 13.



JPO Machine translation abstract:

(57) **Abstract**

SUBJECT When coding video using inter frame prediction, inter-frame predictive efficiency is raised and this reduces encoded information.

Means for Solution An image comparison corresponding to a reference frame number and these reference frame number of a time series is memorized by a frame number and the coded image memory 5. The image comparison specification part 3 hands over the reference frame number 6 in a frame number and the coded image memory 5, obtains the image comparison 7 of this reference frame number, generates the estimated image 4, and outputs the reference frame number data 9 which coded this reference frame number. In the forecast processing part 2, the inputted image 1 is compared with the estimated image 4, the prediction error image 8 is outputted, it is coded in the prediction error coding part 10, and the prediction error image 8 serves as the coding data 11. In the multiplex processing section 12, the coding data 11 and the reference frame number data 9 multiplex, and it is outputted to a decoder as the multiplexing coding data 13.

Claim(s)

Claim 1 In a video encoding method which codes video using inter frame prediction, A video encoding method, wherein a frame number of the order of a time series is given to coded image data, and it predicts to a picture which it is going to code from now on using a picture coded **arbitrary** and a frame number of a coded picture used for prediction also codes.

Claim 2A video encoding method of Claim 1 which uses for prediction two or more coded pictures to which a maximum was set.

Claim 3 The video encoding method according to claim 2 which uses linear combination of two or more coded pictures for prediction.

Claim 4 The video encoding method according to claim 1 which uses for prediction linear combination of a part image which divided the whole picture into portions of arbitrary sizes and

shape.
Claim 5 The video encoding method according to claim 1 which uses for prediction only a picture of a frame number near the frame number of a picture which it is going to code from now on.
Claim 6A video encoding method of five given in any 1 paragraph from Claim 1 by which an identifier of a field unit is added to a frame number.
Claim 7A video decoding method predicting by getting to know a frame number of an image used for prediction to an image which it is going to decode after this in a video decoding method corresponding to a video encoding method of six given in any 1 paragraph from Claim 1.
Claim 8A video decoding method of Claim 7 which uses for prediction two or more coded pictures to which a maximum was set.
Claim 9 The video decoding method according to claim 8 which uses linear combination of two or more coded pictures for prediction.
Claim 10 The video decoding method according to claim 7 which uses for prediction linear combination of a part image which divided the whole picture into portions of arbitrary sizes and shape.
Claim 11 The video decoding method according to claim 7 which uses for prediction only a picture of a frame number near the frame number of a picture which it is going to code from now on.
Claim 12A video decoding method of 11 given in any 1 paragraph from Claim 7 by which an identifier of a field unit is added to a frame number.
Claim 13A frame number and a coded image memory to which a reference frame number of the order of a time series was given and which has memorized a coded image comparison, A reference frame number is handed over in said frame number and coded image memory, Obtain said corresponding image comparison and the best estimated image of predictive efficiency is generated from the inside, Or divide the whole picture into portions of arbitrary sizes and shape, determine image comparison data and a reference frame number for every portion of the, and an estimated image is generated, An image comparison setting means which codes said reference frame number and is outputted as reference frame number data, A prediction processing means to output a prediction error comparing an inputted image with said estimated image, Coding equipment which has a multiplexing processing means to code said prediction error, to multiplex a prediction error encoding means outputted as coding data, and said coding data and said reference frame number data, and to output as multiplexing coding data.
Claim 14A Separation Sub-Division means to divide into coding data and a reference frame number multiplexing coding data which is a decoder corresponding to Claim 13 and was outputted from said multiplexing processing means, A prediction error decoding means which decodes said coding data and is changed into a prediction error, a frame number and a coded image memory in said coding equipment -- the same -- with a frame number and a coded image memory which has memorized an image comparison in which a reference frame number was given. Input a reference frame number from said Separation Sub-Division means, and this reference frame number is handed over in said frame number and coded image memory, A decoder which has an image comparison number decoding means which receives a corresponding image comparison, and generates and outputs an estimated image like said image comparison setting means, and an estimated image summing processing means to add said estimated image to said prediction error, and to output a decoded image.

Detailed Description of the Invention
0001
Field of the Invention This invention relates to the video encoding method and decoding method which code video using inter frame prediction.
0002
Description of the Prior Art By the conventional method, the way the direction of prediction saw by a time series, and predicted a new frame from an old frame was taken in the interframe predictive coding which uses one image comparison. Therefore, opposite direction prediction cannot be performed in simple inter frame prediction.
0003 The inside of the frame to which interframe predictive coding of the above was carried out in

the case of frame interpolation prediction, Two frames which see and continue by processing order can be used as a reference frame, and only the frame which sees by a time series and is pinched among those reference frames can use both reference frames as an image comparison. The frame which predicts two reference frames as an image comparison was not able to be used as an image comparison in the coding processing after it.

0004 This is because the rule which is carried out based on one or two frames which carried out interframe coding to just before, and is used as an image comparison defines the frame which can be referred to.

0005 The encoding order of the conventional method and the example of an image comparison are shown in drawing 3. The frame number of the frame of 1, 5, and 8 is a reference frame, and interframe predictive coding of the 5th and the 8th frame is carried out based on the 1st frame. The frame interpolation coding of the 2nd inserted into them, the 3rd, and the 4th frame is carried out from the 1st and the 5th frame, and, as for the 6th and the 7th frame, frame interpolation coding is carried out from the 5th and the 8th frame.

0006

Problem(s) to be Solved by the Invention It was impossible to have seen by a time series and to have predicted by using a new frame as an image comparison in the conventional prediction method. It was impossible to have seen by a time series and to have used two or more frames for prediction from the same direction. There was restriction that the reference frame coded immediately before was to two.

0007 The purpose of this invention raises inter-frame predictive efficiency, reduces encoded information by that cause, and there is in providing the video encoding method and decoding method which raise the compression ratio of a picture, the coding equipment corresponding to these, and a decoder.

0008

Means for Solving the ProblemA video encoding method of this invention gives a frame number of the order of a time series to coded image data, it predicts to a picture which it is going to code from now on using a picture coded **arbitrary** , and a frame number of a coded picture used for prediction also codes.

0009A video decoding method of this invention predicts by getting to know a frame number of an image used for prediction to an image which it is going to decode from now on.

0010 By giving a frame number of the order of a time series to a header of coded image data, and specifying an image comparison from the frame number at the time of decoding, distinction called inter frame prediction and frame interpolation prediction is lost, and a frame which can be referred to in prediction, and its number are generalized.

0011 When coding a picture which is a coding subject using motion compensation inter frame prediction, two or more pictures of already coded arbitrary frame numbers can be used for prediction by specifying two or more frame numbers of an image comparison used for prediction.

0012 Encoding order and an example of an image comparison are shown in drawing 2, and relation between a processing picture corresponding to this and a reference frame number is shown in Table 1.

0013

Table 1

For drawings please refer to the original document.

0014 Linear combination prediction by two frames or three frames can be made intermingled by using a reference frame number regardless of a direction which performs inter frame prediction and inter frame prediction of an opposite direction, as shown in Table 1. Although here showed to an example used for prediction with reference to a maximum of three frames, four or more frames may be sufficient as a reference frame number.

0015 In the decoding side, the frame number in the header of the image decoded beforehand and the decoded image which decoded corresponding image data are memorized, and an estimated image is generated like the coding side.

0016 According to the embodiment of this invention, two or more frames referred to as an

estimated image are prepared, they are changed, and it uses for prediction, or predicts by the linear combination of two or more pictures. Here, it not only can process prediction mode called such changes and linear combination to the whole picture of one frame, but it can process it to the part image which divided the whole picture into the portions of arbitrary sizes and shape.
0017 For example, in drawing 2, although the 5th, the 7th, and the 8th frame can be used for the 6th-frame prediction, the example in the usable prediction mode to the 6th frame is shown in Table 2 as an example.
0018
Table 2

For drawings please refer to the original document.

0019 In other embodiments of this invention, the frame number which memorizes the picture required for prediction is restricted to +one N+M by restricting the frame referred to as an estimated image to the range of a frame to **-N, +M** frame to be coded from now on. When this restriction does not exist, it is necessary to store all the pictures coded in the past.
0020 In the embodiment of further others of this invention, video with an interlace signal like the present television signal. When the picture of one frame consists of the picture of the 2 fields by jump operation, not only a frame but the identifier of the field is used, and prediction of a field unit is enabled.
0021 The frame number and coded image memory the coding equipment of this invention has remembered the coded image comparison in which the reference frame number of the order of a time series was given to be, A reference frame number is handed over in said frame number and coded image memory, Obtain said corresponding image comparison and the best estimated image of predictive efficiency is generated from the inside, Or divide into the portions of the arbitrary sizes of the whole picture, and shape, determine image comparison data and a reference frame number for every portion of the, and an estimated image is generated, The image comparison setting means which codes said reference frame number and is outputted as reference frame number data, A prediction processing means to output a prediction error comparing an inputted image with said estimated image, Said prediction error is coded, and the prediction error encoding means outputted as coding data, and said coding data and said reference frame number data are multiplexed, and it has a multiplexing processing means to output as multiplexing coding data.
0022A Separation Sub-Division means to divide into coding data and a reference frame number the multiplexing coding data in which the decoder of this invention was outputted from said multiplexing processing means, The prediction error decoding means which decodes said coding data and is changed into a prediction error, the frame number and coded image memory in said coding equipment -- the same -- with the frame number and coded image memory which has memorized the image comparison in which the reference frame number was given. Input a reference frame number from said Separation Sub-Division means, and this reference frame number is handed over in said frame number and coded image memory, A corresponding image comparison is received and it has an image comparison number decoding means which generates and outputs an estimated image like said image comparison setting means, and an estimated image summing processing means to add said estimated image to said prediction error, and to output a decoded image.
0023
Embodiment of the Invention Next, an embodiment of the invention is described with reference to Drawings.
0024 Drawing 1 is a block diagram of the coding equipment of one embodiment of this invention, and a decoder.
0025 Coding equipment comprises the forecast processing part 2, the image comparison specification part 3, a frame number and a coded image memory 5, the prediction error coding part 10, and the multiplex processing section 12.
0026 The decoder comprises the separation sections 21, the prediction error decoding part 24, the estimated image addition processing section 31, the image comparison number decoding part 26, and a frame number and a coded image memory 28.

0027. The reference frame number of the time series was given to the frame number and the coded image memory 5. The coded image comparison is memorized, the reference frame number of a time series is given to a frame number and the coded image memory 28, and the same image comparison as the image comparison memorized by the coded image memory 5 is memorized.
0028 The inputted image 1 is inputted into the forecast processing part 2, it is compared with the estimated image 4, and the prediction error image 8 is outputted. The image comparison specification part 3 hands over the reference frame number 6 in a frame number and the coded image memory 5, and obtains the image comparison data 7. As a result, in the image comparison specification part 3, the estimated image 4 with the most sufficient predictive efficiency is generated out of the image comparison data 7 which serves as a candidate of prediction. Or in the image comparison specification part 3, the whole picture is divided into the portions of arbitrary sizes and shape, and the image comparison data used for prediction for every portion of the and a reference frame number are determined. The linear combination of two or more image comparison data can be used for this prediction. The smallest thing of a prediction error is chosen among the candidates of an estimated image. From the image comparison specification part 3, the reference frame number data 9 which coded the reference frame number selected besides the estimated image 4 is outputted. It is coded in the prediction error coding part 10, and the prediction error image 8 is outputted as the coding data 11. The coding data 11 and the reference frame number data 9 are multiplexed in the multiplex processing section 12, and are outputted from coding equipment as the multiplexing coding data 13.
0029 In a decoder, the inputted multiplexing coding data 13 is divided into the coding data 22 and the reference frame number data 23 in the separation sections 21. In the prediction error decoding part 24, the coding data 22 is decoded and is changed into the prediction error image 25. The reference frame number data 23 is inputted into the image comparison number decoding part 26, specifies the reference frame number 29 to a frame number and the coded image memory 28 for every Type in a picture, and receives the image comparison data 30. In the image comparison number decoding part 26, the estimated image 27 is generated like the image comparison specification part 3, and it is outputted to the estimated image addition processing section 31. In the estimated image addition processing section 31, the estimated image 27 is added to the prediction error image 25, and the decoded image 32 is outputted.
0030
Effect of the Invention As explained above, this invention by embedding the frame number referred to at the time of inter frame prediction at coding data, The flexibility of an image comparison improves, and since opposite direction prediction and prediction by the picture of three or more frames can also be efficiently predicted according to the feature of image rows, such as becoming possible, it is effective in the compression ratio in coding improving.

Field of the Invention This invention relates to the video encoding method and decoding method which code video using inter frame prediction.

Description of the Prior Art By the conventional method, the way the direction of prediction saw by a time series, and predicted a new frame from an old frame was taken in the interframe predictive coding which uses one image comparison. Therefore, opposite direction prediction cannot be performed in simple inter frame prediction.
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Problem(s) to be Solved by the Invention It was impossible to have seen by a time series and to have predicted by using a new frame as an image comparison in the conventional prediction method. It was impossible to have seen by a time series and to have used two or more frames for prediction from the same direction. There was restriction that the reference frame coded immediately before was to two.
0007 The purpose of this invention raises inter-frame predictive efficiency, reduces encoded information by that cause, and there is in providing the video encoding method and decoding method which raise the compression ratio of a picture, the coding equipment corresponding to these, and a decoder.

Means for Solving the ProblemA video encoding method of this invention gives a frame number of the order of a time series to coded image data, it predicts to a picture which it is going to code from now on using a picture coded **arbitrary** , and a frame number of a coded picture used for prediction also codes.
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0010 By giving a frame number of the order of a time series to a header of coded image data, and specifying an image comparison from the frame number at the time of decoding, distinction called inter frame prediction and frame interpolation prediction is lost, and a frame which can be referred to in prediction, and its number are generalized.
0011 When coding a picture which is a coding subject using motion compensation inter frame prediction, two or more pictures of already coded arbitrary frame numbers can be used for prediction by specifying two or more frame numbers of an image comparison used for prediction.
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For drawings please refer to the original document.

0014 The linear combination prediction by two frames or three frames can be made intermingled by using a reference frame number regardless of the direction which performs the inter frame prediction and inter frame prediction of an opposite direction, as shown in Table 1. Although here showed to the example used for prediction with reference to a maximum of three frames, four or

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specification part 3, a frame number and a coded image memory 5, the prediction error coding part 10, and the multiplex processing section 12.
0026 The decoder comprises the separation sections 21, the prediction error decoding part 24, the estimated image addition processing section 31, the image comparison number decoding part 26, and a frame number and a coded image memory 28.
0027. The reference frame number of the time series was given to the frame number and the coded image memory 5. The coded image comparison is memorized, the reference frame number of a time series is given to a frame number and the coded image memory 28, and the same image comparison as the image comparison memorized by the coded image memory 5 is memorized.
0028 The inputted image 1 is inputted into the forecast processing part 2, it is compared with the estimated image 4, and the prediction error image 8 is outputted. The image comparison specification part 3 hands over the reference frame number 6 in a frame number and the coded image memory 5, and obtains the image comparison data 7. As a result, in the image comparison specification part 3, the estimated image 4 with the most sufficient predictive efficiency is generated out of the image comparison data 7 which serves as a candidate of prediction. Or in the image comparison specification part 3, the whole picture is divided into the portions of arbitrary sizes and shape, and the image comparison data used for prediction for every portion of the and a reference frame number are determined. The linear combination of two or more image comparison data can be used for this prediction. The smallest thing of a prediction error is chosen among the candidates of an estimated image. From the image comparison specification part 3, the reference frame number data 9 which coded the reference frame number selected besides the estimated image 4 is outputted. It is coded in the prediction error coding part 10, and the prediction error image 8 is outputted as the coding data 11. The coding data 11 and the reference frame number data 9 are multiplexed in the multiplex processing section 12, and are outputted from coding equipment as the multiplexing coding data 13.
0029 In a decoder, the inputted multiplexing coding data 13 is divided into the coding data 22 and the reference frame number data 23 in the separation sections 21. In the prediction error decoding part 24, the coding data 22 is decoded and is changed into the prediction error image 25. The reference frame number data 23 is inputted into the image comparison number decoding part 26, specifies the reference frame number 29 to a frame number and the coded image memory 28 for every Type in a picture, and receives the image comparison data 30. In the image comparison number decoding part 26, the estimated image 27 is generated like the image comparison specification part 3, and it is outputted to the estimated image addition processing section 31. In the estimated image addition processing section 31, the estimated image 27 is added to the prediction error image 25, and the decoded image 32 is outputted.

Brief Description of the Drawings
Drawing 1 It is a block diagram of the coding equipment of one embodiment of this invention, and a decoder.
Drawing 2 It is a figure showing the encoding order by Claim 1 of this invention, and the example of an image comparison.
Drawing 3 It is a figure showing the encoding order of the conventional method, and the example of an image comparison.
Description of Notations
1 Inputted image
2 Forecast processing part
3 Image comparison specification part
4 Estimated image
5 A frame number and a coded image memory
6 Reference frame number
7 Image comparison data
8 Prediction error image
9 Reference frame number data
10 Prediction error coding part

11 Coding data
12 Multiplex processing section
13 Multiplexing coding data
21 Separation sections
22 Coding data
23 Reference frame number data
24 Prediction error decoding part
25 Prediction error image
26 Image comparison number decoding part
27 Estimated image
28 A frame number and a coded image memory
29 Reference frame number
30 Image comparison data
31 Estimated image addition processing section
32 Decoded image

Drawing 2

For drawings please refer to the original document.

Drawing 3

For drawings please refer to the original document.

Drawing 1

For drawings please refer to the original document.

For drawings please refer to the original document.
